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| 09/008,497      | 01/16/1998  | HIROYUKI INOUE       | 0433/00547          | 6301             |

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| EXAMINER |
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| ART UNIT | PAPER NUMBER |
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2814

DATE MAILED: 12/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/008,497

Applicant(s)

INOUE, HIROYUKI

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9,21-32 and 34-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-9,21-32 and 34-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

***Response to Amendment***

Applicants' amendment filed on October 15, 2003 has been entered on October 22, 2003.

Therefore claims 1,21,28,31,34,38 and 39 as amended by the amendment and claims 2-9 and 22-27,29-30,32,35-36 and 37 as previously recited are currently pending in the Application.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 to 9 and 21 to 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu ( U.S Patent No. 4,994,402 herein after Chiu) OR Matthews ( U.S. Patent No. 5,134, 083 herein after Matthews) both previously applied.

With respect to claim 1 Chiu or Matthews describe a method for manufacturing a semiconductor device having a buried conductive layer which is connected to one of a source and drain of a MOS transistor and which extends over a gate electrode of said MOS transistor, said method comprising: ( Chiu col.1 line 32, Matthews Abstract lines 2-3)

forming a first insulating film on a semiconductor substrate; ( Chiu fig. 1 # 12, 13, Matthews fig. 5 A # 28)

forming a first conductive film as said gate electrode ( Chiu fig. 1 # 16 , Matthews fig. 6 A # 26 and a second insulating film on said first insulating film, ( Chiu figure 1 # 20, Matthews figure 7 A # 32) said gate electrode having a width equal to a minimum processing size achievable with a conventional lithographic process technique; ( Chiu col. 2 lines 13 to 20 Matthews col. 1 lines 43-46)

forming a third insulating film on the whole surface of said semiconductor substrate having said first insulating film, said first conductive film and said second insulating film formed thereon ; ( Chiu figures 5-6 etc. and col. 5 lines 48-55, Matthews fig. 9 A).

selectively etching away said third insulating film so as to form first side wall insulating films including said third insulating film on each of both side faces of said first conductive film and said second insulating film

said selective etching exposing said semiconductor substrate in portions which are not covered with said side wall insulating film and not covered with said first conductive film; ( Chiu figure 6 and Matthews figure 9 A).

said selective etching exposing diffusing impurities into said exposed portions of said semiconductor substrate so as to form a source and a drain in said semiconductor substrate; ( Chiu figure 6, Matthews 10 A).

forming a second conductive film to be a part of said buried conductive layer on the whole surface of said semiconductor substrate having said first insulating film, said first conductive film, said second insulating film and said side wall insulating film formed thereon; forming ( Chiu figure 7 # 65, Matthews figure 11 B # 58) a first mask layer on

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said second conductive film; ( Chiu figures 9, 10, col. 6 line 6 Matthews fig. 11b and 12 A )

processing said first mask layer to have a pattern which is separated into both side portions as to said first conductive film; ( Chiu figure 10, Matthews figure 12 A).

forming a second mask layer on the whole surface of said semiconductor substrate having said first insulating film, said first conductive film, said second insulating film, said side wall. insulating film, said second conductive film and said first mask layer formed thereon; ( Chiu col.2 lines 61-64, Matthews figure 13 A).

selectively etching away said second mask layer so as to leave a pattern of said second mask layer as second side walls on each of both side faces of the pattern of said, first mask ( Chiu figures 11, 12 and Matthews ( Chiu figure 10, Matthews figure 14 A )

selectively etching away said second conductive film with the patterns of said first and second mask layers as a mask so as to process said second conductive film into a pattern in which said second conductive film is separated on said second insulating film by an opening between the second side walls smaller than the minimum processing size achievable with the conventional lithographic process technique and ( Chiu figure 10, Matthews figure 14 A ) , said second conductive film which extends over the gate electrode of the MOS transistor. ( Chiu figures 11, 12 etc. Matthews figure 19, # 90 ).

Ensuring that the opening between the second side wall does not overlap either of the first sidewall insulating films or either of the source and drain. ( Chiu col. 2 line 25, Matthews fig. 14 A ) .

It is noted that Chiu and Matthews may have additional steps in their process , however the instant claims include the term “ comprising “ that does not exclude additional steps and further current case law states : As a matter of fact selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results ( In re Burhans, 154 F. 2d 6890, 69 USPQ330 (CCPA 1946).

With respect to claims 2 and 4 Matthews in figure 20 A and Chiu in figure 13 disclose a mask layer on an insulating film and a mask on a conductive film.

With respect to claim 3 the recitation of forming two mask layers ( See rejection of claim 1 above) .

With respect to claim 5 Chiu col. 7 lines 20-25 and Matthews figs. 16 to 18 disclose two mask layers formed on a conductive film.

With respect to claim 6, it repeats all the steps of claim 1 and then adds the step of forming a wiring layer which is connected to said second conductive film at the bottom of said contact hole . ( Chiu fig 12 , plugs 91, 93 , col. 6 lines 66-68, Matthews fig 22 A).

With respect to claims 7 to 9, it repeats all the steps of claim 1 and then adds the step of coating the third conductive film with a dielectric , forming a fourth conductive film and patterning it into a electrode pattern ( Matthews fig. 26 A).

Claim 21 repeats the steps of claim 1 and additionally recites the step of having an opening smaller than the minimum processing size ( Chiu col. 2 lines 11-20, Matthews col.1 lines 40-52) and also the rejection under claim 1 is incorporated here by reference.

Claim 22 describes the distance between the two conductive layers as  $1/3$  of the minimum processing size feature, the mere recitation of a range without any showing of unexpected results or criticality does not patentably distinguish it over the prior art.

Claim 23 -27,30 the two conductive layers and the mask layer of insulating film is repeated from claim 1.

Claims 28-29 repeat the steps of claims 1, 21 and additionally recites the step of wherein the opposing faces of the at least two portions extend over a central portion of the gate structure ( Chiu figures 8-12, etc., Matthews figure 19 A etc.) and also the rejection under claim 1 is incorporated here by reference.

Claims 31-33 repeat the steps of 28, 29 and 22.

Claims 34 -37 repeat the steps of claim 23 -26 except for calling the hole in claims 23-26 contact holes in claim 23-26, and the step of said contact hole extending over at least one of the source and drain regions and extending over only a side portion of the gate electrode . ( Chiu figures 11, 12 etc. Matthews figure 19, # 90 ).

Claim 37 repeats the steps of claim 28.

Claim 38 repeats the steps of claim 21 including the step of wherein the sidewall spacers are centrally arranged interior to edges of the structure.

Claim 39 repeats the steps of claim 21.

### **Response to Arguments**

Applicants arguments filed January 15, 2003 have been considered, but are not persuasive for the following reasons :

Applicants' first contention that the Office Action does not provide the claimed limitation not being explicitly taught is not persuasive because as previously stated, both Chiu and Matthews may describe additional steps in their process which is not presently recited in the claims in question, but as admitted by the Applicants' (response of Oct. 22/ 2003 page 11 5 para comprising is used to reflect the applicant's invention is not limited to claimed inventions and may include additional steps.

Further it is noted that Chiu and Matthews may not describe their steps in same exact order as may be recited in the claims, however in view of *In re Burhans* the selection of a different order of performing the process steps is *prima facie* obvious without a showing of new or unexpected results.

Therefore *prima facie* case of obviousness is established.

Applicants' contention that Chiu because it describes a slight misalignment of one of the holes with respect to pad that lies underneath it, one can conclude Chiu teaches away from Applicants' hole alignment is not persuasive because Chiu in the cited section herein only states than one hole can be slightly misaligned and in fact in all claims recite self aligned contact structure i.e holes and pad.

If Applicants' want to distinguish the prior art from their claims with regard to this feature, they may recite that their holes are aligned to the pad without even slight misalignment.

Applicants' argument that Chiu or Matthews do not acknowledge the technical problems solved is not persuasive because the alleged technical problems being solved



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by Applicants' invention are presently not recited in the claims and therefore cannot be given patentable weight.

Sub lithographic features are taught by Chiu col. 1 lines 60-65 and Matthews col. 12 lines 20-25 .

Applicants' contention that Chiu reference is not directed to feature sizes or holes having dimensions smaller than that achievable by standard photolithographic techniques is not persuasive because Chiu in col. 2 lines 10 to 20 states :

Methods such as reflow, salicide and planarization have been tried in a continuing effort to solve these problems. However, as the device dimensions have shrunk into the submicron range, these methods have been inadequate to solve all of the problems simultaneously. Accordingly there remains a need for a way to fabricate low-resistance contacts in semiconductor devices having dimensions in the submicron range without suffering the ill effects of junction spiking, high junction capacitance and contact etch stop problems.

Applicants' second argument that Chiu teaches away from the Applicants' disclosed and recited invention is not persuasive because the claims as presently recited do not recite any alignment of holes, similarly the objective/s of the invention are not presently recited in the claims.

Applicants' third argument that Matthews does not acknowledge sub-photolithographic feature sizes in a semiconductor device is not persuasive because Matthews col. 1 lines 42-47 states :

repeated. Using state-of-the-art optics, projection printing (also frequently referred to as direct-step-on-wafer or step-and-repeat) systems are capable of producing sub-micron resolutions.

Applicants' next contentions that the applied art does not teach/suggest the presently newly added limitations , " which extends over a gate electrode of said MOS

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transistor" and " wherein the buried conductive layer extends over the gate electrode of the MOS transistor " ; " wherein said sidewalls are formed so as to be between and Offset from end portions of the semiconductor element" ; " said contact hole extending over at least one of the source and drain regions, and extending over only a side portion of the gate electrode " are s not persuasive for reasons stated in the rejections of the claims above.

Dependent claims 2-9,22-27, 29-30, 32, 35-37 and 39 were alleged to be allowable because they depend upon allegedly allowable independent claims.

However as seen above none of the independent claims are allowable therefore the dependent claims are also not allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


Any inquiry concerning this communication or earlier communication from the examiner should be directed to Steven H. Rao whose telephone number is (703) 306-5945. The examiner can normally be reached on Monday- Friday from approximately 7:00 a.m. to 5:30 p.m.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. The Group facsimile number is (703) 308-7724.

  
Steven H. Rao

Patent Examiner

December 26, 2003.

  
LONG APPLICANT  
PRIMARILY EXAMINEE